

### III. Reading MODIS files in IDL

Reading MODIS Oceans products (Level 2 and Level 3) into IDL is relatively simple with the 2 IDL routines provided, which are found on the website ‘Visualizing and Working with MODIS Ocean Data.’ <http://modis-ocean.gsfc.nasa.gov/tools.html>. In the following example, you will be using these 2 routines to read in MODIS products, display the images, and use quality flags to extract and plot data. These routines can be used to read any of the MODIS products and any Level 2 quality flag. Check the web page for more in-depth information.

**Start IDL** - Launch IDL by typing *idlde* from a shell window (**NOTE:** SeaDAS must not be running for IDL to launch!).

#### Example of Reading in products with the *Get\_SDS* function in IDL

1. Define the filename and input directory:

```
IDL> fname = 'MODOCL2B.A2001095.1605.004.2002186051608.hdf'  
IDL> l2dir = '/net/home/modis/images/l2/'
```

2. Load the chlor\_a2 data:

```
IDL> chlor_a2=Get_SDS(l2dir+fname,'chlor_a_2')
```

3. Load the ‘Rainbob’ color palette:

```
IDL> loadct, 54
```

4. Since products are stored as integers in the MODIS HDF files, they must be converted to floating point values using a translation stored as a ‘Slope’ and ‘Intercept’ value in the HDF file. These values are obtained as follows:

```
IDL> Get_HDFMeta,l2dir+fname, 'chlor_a_2', units, slope, int, equation,  
date, proftime <CR>
```

5. Translate chlor\_a2 integer array into floating point values and ‘reverse’ the image (see \*NOTE 1).

```
IDL> chlor_a2 = float(reverse(chlor_a2,2))*slope + int
```

6. Display the image using the *scroll\_window* routine (see \*\*NOTE 2):

```
IDL> scroll_window, chl2gry(chlor_a2)
```

\* NOTE 1: IDL reads in MODIS hdf images in reverse order.

\*\* NOTE 2: Images can only be displayed as ‘byte’ arrays. The *chl2gry* function translates the image from floating point values to byte values (= 0-255).

### Example of Reading in Quality flags using the *Bit* function in IDL

1. Load the quality byte for the Group 2 Level 2 product (see \*NOTE 1):

```
IDL> quality_ocl2b = Get_SDS(l2dir+fname,'quality')
```

2. The quality flag bit ‘pairs’ are described on the website ‘Level 2 Quality Flag Levels’. The chlor\_a2 quality flags are stored in bits 7 and 8. To access these bits, use the *bit* function:

```
IDL> qual_chlor_a2 = bit(quality_ocl2b,7,2)
```

The ‘7’ indicates the bit position, and the ‘2’ indicates the number of bits to extract. This function returns a longword (4 bytes). However, the values returned are 0, 1, 2 and 3.

3. Reverse the qual\_chlor\_a2 image and transform it from a longword to a byte:

```
IDL> qual_chlor_a2 = byte(reverse(qual_chlor_a2,2))
```

4. Load quality flag color palette:

```
IDL> loadct, 56
```

5. Use the *scroll\_window* routine again to display the image:

```
IDL> scroll_window,qual_chlor_a2
```

Color code:

Quality 0: Green  
Quality 1: Blue  
Quality 2: Red  
Quality 3: Black

\*NOTE 1: The product groups MODOCL2, MODOCL2B, and MOD28L2 each have a 1-byte quality flag structure. The product group MODOCL2A has a 4-byte quality flag structure.

### Example of mapping L2 image data

This example uses the *map\_L2* routine from Miami (contained in *mocean\_l2\_map.pro*), and maps a level 2 granule product to a global map. It also displays data associated with a given quality level.

1. Create some shortcut string arrays for filenames:

```
IDL> focl2b='MODOCL2B.A2001095.1605.004.2002186051608.hdf'  
IDL> fgeo='MOD03.A2001095.1605.003.2001216184915.hdf'
```

2. Compile the IDL program file containing *map\_L2*:

```
IDL> .run mocean_l2_map.pro
```

3. Call the *map\_L2* routine to map the ‘chlor\_a2’ product, with quality=0 data, within the range of 0 and 3:

```
IDL> map_L2, l2dir+focl2b, l2dir+fgeo, 'chlor_a_2', 1, 0.0, 3.0
```

### Example of using Level 3 products with the *Get SDS* and *Bit* functions in IDL

1. Define the filenames:

```
IDL> fname1 = 'MO04MM26.chlor_a_2.ADD2001121.004.2002211074022.hdf'  
IDL> fname2 = 'MO04QM26.chlor_a_2.ADD2001121.004.2002211074542.hdf'  
IDL> l3dir = '/net/home/modis/images/l3/'
```

2. Load the chlor\_a2 and quality flag products:

```
IDL> chlor_a2_l3=Get SDS(l3dir + fname1, 'chlor_a_2_mean')  
IDL> chlor_a2_qual_l3=Get SDS(l3dir + fname2, 'chlor_a_2_qual_b')
```

3. Get slope and intercept data, and transform the image

```
IDL> Get_HDFMeta, l3dir + fname1, 'chlor_a_2_mean', units, slope, int,  
equation
```

```
IDL> chlor_a2_l3=reverse(chlor_a2_l3*slope +int,2)  
IDL> chlor_a2_qual_l3=reverse(chlor_a2_qual_l3,2)
```

4. Display the chlor\_a2 image using the *scroll\_window* routine:

```
IDL> loadct,54 ('Rainbob')  
IDL> scroll_window, chl2gry(chlor_a2_l3)
```

5. Display the chlor\_a2 quality image using the *scroll\_window* routine:

```
IDL> loadct,56  
IDL> scroll_window, chlor_a2_qual_l3
```